

Characterization Data Summary  
IHSS Group 700-3



January 2003



ADMIN RECORD

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**Characterization Data Summary  
IHSS Group 700-3**

**January 2003**

## Table of Contents

1.0 Introduction .....	1
2.0 Site Characterization .....	1
3.0 Deviations From Planned Sampling Specifications .....	12
4.0 Data Quality Assessment.....	13
5.0 References .....	16

## List of Figures

Figure 1 IHSS Group 700-3 Location Map.....	2
Figure 2 Soil Results Greater Than Background Mean Plus Two Standard Deviations or Reporting Limits.....	3

## List of Tables

Table 1 IHSS Group 700-3 Description.....	1
Table 2 IHSS Group 700-3 Proposed Characterization Sampling Specifications .....	7
Table 3 IHSS Group 700-3 Soil Results with RFCA Action Levels and Results Greater than Background Mean Plus Two Standard Deviations or Reporting Limits ....	9
Table 4 IHSS Group 700-3 Summary of Analytical Results with RFCA Action Levels– Surface Soils .....	11
Table 5 IHSS Group 700-3 Summary of Analytical Results with RFCA Action Levels– Subsurface Soils .....	14
Table 6 IHSS Group 700-3 Deviations from Planned Sampling Specifications.....	16

## Enclosure

Compact Disc - IHSS Group 700-3 Raw Data

## ACRONYMS

AL	action level
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	U.S. Department of Energy
DQA	Data Quality Assessment
DQO	Data Quality Objective
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ER RSOP	Environmental Restoration RFCA Standard Operating Procedure
HPGe	high-purity germanium detector
IA	Industrial Area
IASAP	Industrial Area Sampling and Analysis Plan
IHSS	Individual Hazardous Substance Site
K-H	Kaiser-Hill Company L.L.C.
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
mg/kg	milligram per kilogram
PAC	Potential Area of Concern
PARCCS	precision, accuracy, representativeness, completeness, comparability, and sensitivity
pCi/g	picocurie per gram
RFETS	Rocky Flats Environmental Technology Site
RIN	report identification number
RL	reporting limit
RPD	relative percent difference
SOR	sum of ratio
SVOC	semi-volatile organic compound
UBC	under building contamination
µg/kg	microgram per kilogram
VOC	volatile organic compound
V&V	verification and validation
XRF	x-ray fluorescence

## 1.0 INTRODUCTION

This data summary report summarizes initial characterization activities conducted at the request of Building 776/777 Decontamination and Decommissioning personnel.

Additional sampling will be required to make future environmental restoration action decisions. Under building contamination (UBC) for Buildings 776 and 777 is being addressed under Individual Hazardous Substance Site (IHSS) Group 700-3.

Characterization activities were planned and executed in accordance with the Industrial Area Sampling and Analysis Plan (IASAP) (DOE 2001) and IASAP Addendum #IA-02-08 (DOE 2002a).

Sampling activities conducted per IA-02-03 include two UBCs sites that are listed in Table 1 and shown on Figure 1. The remainder of IHSS Group 700-3 will be addressed in separate IASAP Addendum.

**Table 1**  
**IHSS Group 700-3 Description**

<b>IHSS Group</b>	<b>IHSS/PAC/UBC Site</b>
700-3	UBC 776 – Original Plutonium Foundry
	UBC 777 – General Plutonium Research and Development

## 2.0 SITE CHARACTERIZATION

UBC 776 and 777 information consists of historical knowledge (DOE 1992-2001) and five additional sampling locations with specifications as described in IASAP Addendum #IA-02-08 (DOE 2002a). The sampling specifications proposed in the IASAP

Addendum for these characterization samples are listed in Table 2. The location of these samples and analytical results for RFCA-regulated compounds greater than background mean plus two standard deviations or reporting limits are presented in Figure 2. A summary of the analytical results for surface soils is presented in Table 3. A summary of the analytical results for subsurface soils is presented in Table 4. Deviations from planned sampling specifications are presented in Table 5. The raw data are enclosed on a compact disc.

Analytical results indicate that arsenic is above background and the RFCA Tier II action level (AL) at one location beneath Building 777. Additionally, 1,1-Dichloroethene was found at concentrations exceeding the RFCA Tier II AL at two locations under Building 776. All other contaminant concentrations are less than RFCA Tier II ALs. No remedial action decisions are being made based on this initial data set.

**Figure 2**

**Subsurface Soil Results Greater Than Background Mean Plus Two Standard  
Deviations or Reporting Limits**

8

Table 2  
IHSS Group 700-3 Proposed Characterization Sampling Specifications

IHSS Group	IHSS/PAC/UBC Site	Location Code	Easting	Northing	Media	Depth Interval	Analyte	Onsite Method	Offsite Laboratory Method
700-3	UBC 776 – Original Plutonium Foundry and UBC 777 – General Plutonium R&D Biased locations based on process and historical information, including known release/spill sites and features of the building slab (e.g., construction joints and floor cracks where fire water may have migrated to the soil beneath the building).								
		CE46-A000	2083675.523	750570.668	Surface Soil	0-0.5'	Radionuclides	HPGe	Alpha Spec
		CE46-A000	2083675.523	750570.668	Surface Soil	0-0.5'	Metals	6200	6010
		CE46-A000	2083675.523	750570.668	Surface Soil	0-0.5'	VOCs	8260	8260
		CE46-B000	2083675.523	750570.668	Subsurface Soil	0.5'-2.5'	Radionuclides	HPGe	Alpha Spec
		CE46-B000	2083675.523	750570.668	Subsurface Soil	0.5'-2.5'	Metals	6200	6010
		CE46-B000	2083675.523	750570.668	Subsurface Soil	0.5'-2.5'	VOCs	8260	8260
	Sample through joint in slab	CF45-A000	2083787.340	750488.432	Surface Soil	0-0.5'	Radionuclides	HPGe	Alpha Spec
		CF45-A000	2083787.340	750488.432	Surface Soil	0-0.5'	Metals	6200	6010
		CF45-A000	2083787.340	750488.432	Surface Soil	0-0.5'	VOCs	8260	8260
		CF45-B000	2083787.340	750488.432	Subsurface Soil	0.5'-2.5'	Radionuclides	HPGe	Alpha Spec
		CF45-B000	2083787.340	750488.432	Subsurface Soil	0.5'-2.5'	Metals	6200	6010
		CF45-B000	2083787.340	750488.432	Subsurface Soil	0.5'-2.5'	VOCs	8260	8260
		CF45-A001	2083886.142	750528.663	Surface Soil	0-0.5'	Radionuclides	HPGe	Alpha Spec
	Sample where 1st floor slab meets vertical wall for stairwell	CF45-A001	2083886.142	750528.663	Surface Soil	0-0.5'	Metals	6200	6010
		CF45-A001	2083886.142	750528.663	Surface Soil	0-0.5'	VOCs	8260	8260
		CF45-B001	2083886.142	750528.663	Subsurface Soil	0.5'-2.5'	Radionuclides	HPGe	Alpha Spec
		CF45-B001	2083886.142	750528.663	Subsurface Soil	0.5'-2.5'	Metals	6200	6010

IHSS Group	IHSS/PAC/UBC Site	Location Code	Easting	Northing	Media	Depth Interval	Analyte	Onsite Method	Offsite Laboratory Method
HPGe VOC	Sample under basement at Room 127	CF45-B001	2083886.142	750528.663	Subsurface Soil	0.5'-2.5'	VOCs	8260	8260
		CF45-A002	2083892.058	750547.003	Surface Soil	0-0.5'	Radionuclides	HPGe	Alpha Spec
		CF45-A002	2083892.058	750547.003	Surface Soil	0-0.5'	Metals	6200	6010
		CF45-A002	2083892.058	750547.003	Surface Soil	0-0.5'	VOCs	8260	8260
		CF45-B002	2083892.058	750547.003	Subsurface Soil	0.5'-2.5'	Radionuclides	HPGe	Alpha Spec
		CF45-B002	2083892.058	750547.003	Subsurface Soil	0.5'-2.5'	Metals	6200	6010
	Samples where Tanks 1 and 2 leaked	CF45-B002	2083892.058	750547.003	Subsurface Soil	0.5'-2.5'	VOCs	8260	8260
		CG45-A000	2084012.158	750559.427	Surface Soil	0-0.5'	Radionuclides	HPGe	Alpha Spec
		CG45-A000	2084012.158	750559.427	Surface Soil	0-0.5'	Metals	6200	6010
		CG45-A000	2084012.158	750559.427	Surface Soil	0-0.5'	VOCs	8260	8260
		CG45-B000	2084012.158	750559.427	Subsurface Soil	0.5'-2.5'	Radionuclides	HPGe	Alpha Spec
		CG45-B000	2084012.158	750559.427	Subsurface Soil	0.5'-2.5'	Metals	6200	6010
	Sample where Tanks 1103, 1104 and 1105 leaked	CG45-B000	2084012.158	750559.427	Subsurface Soil	0.5'-2.5'	VOCs	8260	8260
		CG45-A001	2083956.545	750379.573	Surface Soil	0-0.5'	Radionuclides	HPGe	Alpha Spec
		CG45-A001	2083956.545	750379.573	Surface Soil	0-0.5'	Metals	6200	6010
		CG45-A001	2083956.545	750379.573	Surface Soil	0-0.5'	VOCs	8260	8260
		CG45-B001	2083956.545	750379.573	Subsurface Soil	0.5'-2.5'	Radionuclides	HPGe	Alpha Spec
		CG45-B001	2083956.545	750379.573	Subsurface Soil	0.5'-2.5'	Metals	6200	6010
		CG45-B001	2083956.545	750379.573	Subsurface Soil	0.5'-2.5'	VOCs	8260	8260
		CG45-B001	2083956.545	750379.573	Subsurface Soil	0.5'-2.5'	VOCs	8260	8260

HPGe high-purity germanium  
VOC volatile organic compound

Table 3

IHSS Group 700-3 Soil Results with RFCA Action Levels and Results Greater than Background Mean Plus Two Standard Deviations or Reporting Limits

UBC	Location	Approximate Easting	Approximate Northing	Analyte	Depth Start (feet)	Depth End (feet)	Result	Reporting Limit	Tier I Action Level	Tier II Action Level	Background Mean+2SD	Unit
UBC 776	CE46-000	2083675.52	750570.67	Barium	0	0.5	342	150	133000	133000	141.26	mg/Kg
UBC 776	CE46-000	2083675.52	750570.67	Copper	0	0.5	43.7	300	71100	71100	18.06	mg/Kg
UBC 776	CE46-000	2083675.52	750570.67	Uranium-235	0	0.5	0.15	1	135	24	0.09	pCi/g
UBC 776	CE46-000	2083675.52	750570.67	Uranium-238/Uranium-234	0	0.5	2	8	586	103	2.00	pCi/g
UBC 776	CE46-000	2083675.52	750570.67	Vanadium	0	0.5	156	100	13400	13400	45.59	mg/Kg
UBC 776	CE46-000	2083675.52	750570.67	Barium	0.5	1.5	424	150	133000	133000	289.38	mg/Kg
UBC 776	CE46-000	2083675.52	750570.67	Copper	0.5	1.5	51.5	300	71100	71100	38.21	mg/Kg
UBC 776	CE46-000	2083675.52	750570.67	Uranium-235	0.5	1.5	0.35	1	113	24	0.12	pCi/g
UBC 776	CE46-000	2083675.52	750570.67	Uranium-238/Uranium-234	0.5	1.5	2.7	8	506	103	1.49	pCi/g
UBC 776	CE46-000	2083675.52	750570.67	Vanadium	0.5	1.5	147	100	13400	13400	88.49	mg/Kg
UBC 776	CF45-002	2083892.06	750547	1,1-Dichloroethene	0	0.5	24.6	6.7	747000	7470	NA	ug/kg
UBC 776	CF45-002	2083892.06	750547	Barium	0	0.5	449	150	133000	133000	141.26	mg/Kg
UBC 776	CF45-002	2083892.06	750547	Lead	0	0.5	26	20	1000	1000	54.62	mg/Kg
UBC 776	CF45-002	2083892.06	750547	Uranium-238/Uranium-234	0	0.5	5.3	8	586	103	2.00	pCi/g
UBC 776	CF45-002	2083892.06	750547	Vanadium	0	0.5	144	100	13400	13400	45.59	mg/Kg
UBC 776	CF45-002	2083892.06	750547	1,1-Dichloroethene	0.5	2.5	24.1	6.1	2190	21.9	NA	ug/kg
UBC 776	CF45-002	2083892.06	750547	Barium	0.5	2.5	460	150	133000	133000	289.38	mg/Kg
UBC 776	CF45-002	2083892.06	750547	Copper	0.5	2.5	65.8	300	71100	71100	38.21	mg/Kg
UBC 776	CF45-002	2083892.06	750547	Uranium-235	0.5	2.5	0.22	1	113	24	0.12	pCi/g
UBC 776	CF45-002	2083892.06	750547	Uranium-238/Uranium-234	0.5	2.5	4.4	8	506	103	1.49	pCi/g
UBC 776	CF45-002	2083892.06	750547	Vanadium	0.5	2.5	107	100	13400	13400	88.49	mg/Kg
UBC 776	CF45-003	2083879.01	750543.22	1,1-Dichloroethene	0	0.5	69.9	6.2	747000	7470	NA	ug/kg
UBC 776	CF45-003	2083879.01	750543.22	Barium	0	0.5	557	150	133000	133000	141.26	mg/Kg
UBC 776	CF45-003	2083879.01	750543.22	Lead	0	0.5	28.7	20	1000	1000	54.62	mg/Kg
UBC 776	CF45-003	2083879.01	750543.22	Uranium-235	0	0.5	0.15	1	135	24	0.09	pCi/g
UBC 776	CF45-003	2083879.01	750543.22	Uranium-238/Uranium-234	0	0.5	4.1	8	586	103	2.00	pCi/g

UBC	Location	Approximate Easting	Approximate Northing	Analyte	Depth Start (feet)	Depth End (feet)	Result	Reporting Limit	Tier I Action Level	Tier II Action Level	Background Mean+2SD	Unit
UBC 776	CF45-003	2083879.01	750543.22	1,1-Dichloroethene	0.5	1.5	108.4	6.2	2190	21.9	NA	ug/kg
UBC 776	CF45-003	2083879.01	750543.22	Barium	0.5	1.5	503	150	133000	133000	289.38	mg/Kg
UBC 776	CF45-003	2083879.01	750543.22	Uranium-235	0.5	1.5	0.17	1	113	24	0.12	pCi/g
UBC 776	CF45-003	2083879.01	750543.22	Uranium-238/Uranium-234	0.5	1.5	4.2	8	506	103	1.49	pCi/g
UBC 776	CF45-003	2083879.01	750543.22	Vanadium	0.5	1.5	92.3	100	13400	13400	88.49	mg/Kg
UBC 777	CG45-000	2084012.16	750559.43	Barium	0	0.5	869	150	133000	133000	141.26	mg/Kg
UBC 777	CG45-000	2084012.16	750559.43	Cobalt	0	0.5	249	90	115000	115000	10.91	mg/Kg
UBC 777	CG45-000	2084012.16	750559.43	Copper	0	0.5	45.4	300	71100	71100	18.06	mg/Kg
UBC 777	CG45-000	2084012.16	750559.43	Barium	0.5	0.67	915	150	133000	133000	289.38	mg/Kg
UBC 777	CG45-000	2084012.16	750559.43	Cobalt	0.5	0.67	116	90	115000	115000	29.04	mg/Kg
UBC 777	CG45-000	2084012.16	750559.43	Copper	0.5	0.67	52.9	300	71100	71100	38.21	mg/Kg
UBC 777	CG45-000	2084012.16	750559.43	Uranium-235	0.5	0.67	0.2	1	113	24	0.12	pCi/g
UBC 777	CG45-000	2084012.16	750559.43	Uranium-238/Uranium-234	0.5	0.67	4.6	8	506	103	1.49	pCi/g
UBC 777	CG45-001	2083956.55	750379.57	Arsenic	0	0.5	13.3	25	299	2.99	10.09	mg/Kg
UBC 777	CG45-001	2083956.55	750379.57	Barium	0	0.5	825	150	133000	133000	141.26	mg/Kg
UBC 777	CG45-001	2083956.55	750379.57	Cobalt	0	0.5	249	90	115000	115000	10.91	mg/Kg
UBC 777	CG45-001	2083956.55	750379.57	Copper	0	0.5	79	300	71100	71100	18.06	mg/Kg
UBC 777	CG45-001	2083956.55	750379.57	Lead	0	0.5	27.9	20	1000	1000	54.62	mg/Kg
UBC 777	CG45-001	2083956.55	750379.57	Uranium-235	0	0.5	0.17	1	135	24	0.09	pCi/g
UBC 777	CG45-001	2083956.55	750379.57	Uranium-238/Uranium-234	0	0.5	1.8	8	586	103	2.00	pCi/g
UBC 777	CG45-001	2083956.55	750379.57	Vanadium	0	0.5	98.7	100	13400	13400	45.59	mg/Kg
UBC 777	CG45-001	2083956.55	750379.57	Barium	0.5	0.75	804	150	133000	133000	289.38	mg/Kg
UBC 777	CG45-001	2083956.55	750379.57	Cobalt	0.5	0.75	122	90	115000	115000	29.04	mg/Kg
UBC 777	CG45-001	2083956.55	750379.57	Copper	0.5	0.75	50.1	300	71100	71100	38.21	mg/Kg
UBC 777	CG45-001	2083956.55	750379.57	Uranium-235	0.5	0.75	0.15	1	113	24	0.12	pCi/g
UBC 777	CG45-001	2083956.55	750379.57	Uranium-238/Uranium-234	0.5	0.75	2.1	8	506	103	1.49	pCi/g

N/A = not applicable

SD = standard deviation

mg/kg = microgram per kilogram

pCi/g = picocurie per gram

ug/Kg = microgram per kilogram

**Table 4**  
**IHSS Group 700-3 Summary of Analytical Results with RFCA Action Levels- Surface Soils**

Analyte	Total Number Samples Analyzed	Detection Frequency (%)	Maximum Concentration	Average Concentration	Unit	Tier I Action Level	Tier II Action Level	Background Mean+2SD
Antimony	5	0	0	0	mg/Kg	768	768	NA
Arsenic	5	80	13.3	7.07	mg/Kg	299	299	10.09
Barium	5	100	869	608.4	mg/Kg	133000	133000	141.26
Cadmium	5	0	0	0	mg/Kg	1920	1920	1.61
Chromium	5	100	43.6	35.02	mg/Kg	44300	4410	16.99
Cobalt	5	40	249	99.6	mg/Kg	115000	115000	10.91
Copper	5	100	79	45.46	mg/Kg	71100	71100	18.06
Iron	5	100	35400	25300	mg/Kg	576000	576000	18037.00
Lead	5	100	28.7	23.36	mg/Kg	1000	1000	54.62
Manganese	5	80	516	283.8	mg/Kg	83600	83600	365.08
Molybdenum	5	0	0	0	mg/Kg	9610	9610	NA
Nickel	5	100	47.8	31.04	mg/Kg	38400	38400	14.91
Selenium	5	0	0	0	mg/Kg	9610	9610	1.22
Silver	5	0	0	0	mg/Kg	9610	9610	NA
Strontium	5	100	208	144.92	mg/Kg	1000000	1000000	48.94
Tin	5	0	0	0	mg/Kg	1000000	1000000	NA
Vanadium	5	100	156	110.36	mg/Kg	13400	13400	45.59
Zinc	5	100	110	79.46	mg/Kg	576000	576000	73.76
1,1,1-Trichloroethane	4	0	0.705	0.62	ug/kg	38400000	38400000	NA
1,1,2,2-Tetrachloroethane	4	0	0.62	0.54	ug/kg	2240000	22400	NA
1,1,2-Trichloroethane	4	0	0.595	0.52	ug/kg	31400000	78600	NA
1,1-Dichloroethane	4	25	2.36	1.00	ug/kg	192000000	192000000	NA
1,1-Dichloroethene	4	25	69.94	24.03	ug/kg	747000	7470	NA
1,2,4-Trichlorobenzene	4	0	0.62	0.55	ug/kg	19200000	19200000	NA
1,2-Dichloroethane	4	0	0.64	0.56	ug/kg	4930000	49300	NA
1,2-Dichlorobenzene	4	0	0.47	0.41	ug/kg	173000000	173000000	NA
1,2-Dichloropropane	4	0	0.55	0.48	ug/kg	6590000	65900	NA

Analyte	Total Number Samples Analyzed	Detection Frequency (%)	Maximum Concentration	Average Concentration	Unit	Tier I Action Level	Tier II Action Level	Background Mean+2SD
1,4-Dichlorobenzene	4	0	0.71	0.63 ug/kg	ug/kg	1870000	187000	NA
2-Butanone	4	0	6.4	5.68 ug/kg	ug/kg	1000000000	1000000000	NA
4-Methyl-2-Pentanone	4	0	4.33	3.84 ug/kg	ug/kg	1540000000	1540000000	NA
Acetone	4	25	13.18	7.49 ug/kg	ug/kg	1920000000	1920000000	NA
Benzene	4	0	0.52	0.46 ug/kg	ug/kg	155000000	155000	NA
Bromodichloromethane	4	0	0.4385	0.38 ug/kg	ug/kg	72300	72300	NA
Bromoform	4	0	0.71	0.63 ug/kg	ug/kg	567000	567000	NA
Bromomethane	4	0	1.02	0.91 ug/kg	ug/kg	2690000	2690000	NA
Carbon Disulfide	4	0	1.765	1.57 ug/kg	ug/kg	1920000000	1920000000	NA
Carbon tetrachloride	4	0	0.75	0.665 ug/kg	ug/kg	3450000	34500	NA
Chlorobenzene	4	0	0.63	0.56 ug/kg	ug/kg	384000000	384000000	NA
Chloroethane	4	0	2.49	2.21 ug/kg	ug/kg	1550000000	1550000	NA
Chloroform	4	0	0.57	0.51 ug/kg	ug/kg	735000000	735000	NA
Chloromethane	4	0	0.895	0.79 ug/kg	ug/kg	345000000	345000	NA
Dibromochloromethane	4	0	0.465	0.41 ug/kg	ug/kg	5340000	53400	NA
Ethylbenzene	4	0	0.68	0.60 ug/kg	ug/kg	1920000000	1920000000	NA
Hexachlorobutadiene	4	0	0.79	0.70 ug/kg	ug/kg	5750000	57500	NA
Methylene chloride	4	0	0.71	0.63 ug/kg	ug/kg	2390000000	598000	NA
Naphthalene	4	0	0.525	0.47 ug/kg	ug/kg	768000000	768000000	NA
Styrene	4	0	0.665	0.59 ug/kg	ug/kg	3840000000	3840000000	NA
Trichloroethene	4	0	0.423	0.38 ug/kg	ug/kg	1630000000	407000	NA
Tetrachloroethene	4	0	0.81	0.72 ug/kg	ug/kg	8620000	86200	NA
Toluene	4	0	0.84	0.74 ug/kg	ug/kg	3840000000	3840000000	NA
Trans-1,3-Dichloropropene	4	0	0.595	0.53 ug/kg	ug/kg	2490000	24900	NA
Vinyl chloride	4	0	1.875	1.66 ug/kg	ug/kg	236000	2360	NA
Xylenes (total)	4	0	1.665	1.48 ug/kg	ug/kg	10000000000	10000000000	NA
Americium-241	5	0	0	0 pCi/g	pCi/g	215	38	0.02
Uranium-235	5	60	0.085	0.05 pCi/g	pCi/g	135	24	0.09
Uranium-238	5	100	2.65	1.42 pCi/g	pCi/g	586	103	2.00

SD = standard deviation  
N/A = not applicable

Table 5  
IHSS Group 700-3 Summary of Analytical Results with RFCA Action Levels-- Subsurface Soils

Analyte	Total Number Samples Analyzed	Detection Frequency (%)	Maximum Concentration	Average Concentration	Unit	Tier I Action Level	Tier II Action Level	Background Mean+2SD
Antimony	5	0	0	0	mg/Kg	768	768	16.97
Arsenic	5	80	12.7	7.39	mg/Kg	299	299	13.14
Barium	5	100	915	621.2	mg/Kg	133000	133000	289.38
Cadmium	5	0	0	0	mg/Kg	1920	1920	1.7
Chromium	5	100	44.5	37.14	mg/Kg	44300	4410	68.27
Cobalt	5	40	122	47.6	mg/Kg	115000	115000	29.04
Copper	5	100	65.8	49.88	mg/Kg	71100	71100	38.21
Iron	5	100	31900	25520	mg/Kg	576000	576000	41046.52
Lead	5	100	23.1	19.58	mg/Kg	1000	1000	24.97
Manganese	5	40	522	188.2	mg/Kg	83600	83600	901.62
Molybdenum	5	0	0	0	mg/Kg	9610	9610	25.61
Nickel	5	100	41.3	31.04	mg/Kg	38400	38400	62.21
Selenium	5	0	0	0	mg/Kg	9610	9610	4.8
Silver	5	0	0	0	mg/Kg	9610	9610	24.54
Strontium	5	100	195	139.1	mg/Kg	1000000	1000000	211.38
Tin	5	40	5.14	1.89	mg/Kg	1000000	1000000	286.31
Vanadium	5	100	147	98.16	mg/Kg	13400	13400	88.49
Zinc	5	100	91.2	76.48	mg/Kg	576000	576000	139.1
1,1,1-Trichloroethane	4	0	0.65	0.61	ug/kg	94800	948	NA
1,1,2,2-Tetrachloroethane	4	0	0.575	0.54	ug/kg	168	1.68	NA
1,1,2-Trichloroethane	4	0	0.555	0.52	ug/kg	1250	12.3	NA
1,1-Dichloroethane	4	25	3.0	1.14	ug/kg	689000	6890	NA
1,1-Dichloroethene	4	50	108.41	33.52	ug/kg	2190	21.9	NA
1,2,4-Trichlorobenzene	4	0	0.575	0.54	ug/kg	433000	4330	NA
1,2-Dichloroethane	4	0	0.595	0.56	ug/kg	668	6.68	NA
1,2-Dichlorobenzene	4	0	0.4355	0.41	ug/kg	1320000	13200	NA
1,2-Dichloropropane	4	0	0.51	0.48	ug/kg	1130	11.3	NA

Analyte	Total Number Samples Analyzed	Detection Frequency (%)	Maximum Concentration	Average Concentration	Unit	Tier I Action Level	Tier II Action Level	Background Mean+2SD
1,4-Dichlorobenzene	4	0	0.66	0.62	ug/kg	165000	1650	NA
Acetone	4	50	17.07	10.02	ug/kg	27200000	272000	NA
Benzene	4	0	0.485	0.45	ug/kg	1410	14.1	NA
Bromodichloromethane	4	0	0.4065	0.38	ug/kg	26400	264	NA
Bromoform	4	0	0.66	0.62	ug/kg	37200	372	NA
Bromomethane	4	0	0.95	0.89	ug/kg	5980	59.8	NA
Carbon Disulfide	4	0	1.64	1.539	ug/kg	988000	9880	NA
Carbon tetrachloride	4	0	0.695	0.66	ug/kg	3560	35.6	NA
Chlorobenzene	4	0	0.585	0.56	ug/kg	83000	830	NA
Chloroform	4	0	0.53	0.49	ug/kg	21400	214	NA
Ethylbenzene	4	0	0.63	0.59	ug/kg	932000	9320	NA
Hexachlorobutadiene	4	0	0.735	0.69	ug/kg	201000	2010	NA
Methylene chloride	4	0	0.665	0.62	ug/kg	578	5.78	NA
Naphthalene	4	0	0.4885	0.46	ug/kg	10100000	101000	NA
Styrene	4	0	0.62	0.58	ug/kg	274000	2740	NA
Trichloroethene	4	0	0.3925	0.37	ug/kg	3280	32.8	NA
Tetrachloroethene	4	0	0.75	0.70	ug/kg	3150	31.5	NA
Toluene	4	0	0.775	0.73	ug/kg	707000	7070	NA
Trans-1,3-Dichloropropene	4	0	0.555	0.52	ug/kg	120	1.2	NA
Vinyl chloride	4	0	1.735	1.63	ug/kg	346	3.46	NA
Xylenes (total)	4	0	1.545	1.45	ug/kg	9740000	97400	NA
Americium-241	5	0	0	0	pCi/g	209	38	0.02
Uranium-235	5	100	0.175	0.11	pCi/g	113	24	0.12
Uranium-238	5	100	2.3	1.8	pCi/g	506	103	1.49

SD = standard deviation

N/A = not applicable

### 3.0 DEVIATIONS FROM PLANNED SAMPLING SPECIFICATIONS

Deviations from the planned sampling specifications described in IASAP Addendum #IA-02-08 (DOE 2002a) are presented in the following table.

**Table 6**  
**IHSS Group 700-3 Deviations from Planned Sampling Specifications**

Location Code	Comments
All	Sample locations not surveyed due to building walls, structures, various obstructions, etc. Approximate locations provided.
CE46-000	Sample interval 0.5 –2.5 terminated at 1.5 feet due to auger refusal. VOC samples not collected from 0 – 0.5 or 0.5 –1.5 foot intervals.
CF45-000	No samples collected due to refusal.
CF45-001	No samples collected due to refusal.
CF45-002	Sample interval 0.5 –2.5 terminated at 1.5 feet due to auger refusal.
CF45-003	Location added by Building 776/777 personnel.
CG45-000	Sample interval 0.5 –2.5 terminated at 0.67 feet due to auger refusal.
CG45-001	Sample interval 0.5 –2.5 terminated at 0.75 feet due to auger refusal.

#### **4.0 DATA QUALITY ASSESSMENT**

This section presents a DQA of the analytical and radiological results from samples collected from the IHSS Group 700-3 during the year 2002. It is based on various criteria derived from EPA Guidance, particularly the DQO process, and DOE quality requirements; references are given in the last subsection of this DQA. The DQA was performed independently of data reduction and evaluation given throughout the remainder of this report. QC evaluations performed on this data set are documented within the MS ACCESS database "700-3.mdb".

##### **DQO Decisions**

Consistent with original DQO decision rules of the project, a sum-of-ratios (SOR) calculation was performed on each sample acquired from the sampling activity. Analytical results from three samples were found to exceed Tier II soil action levels. The elevated results are primarily due to SVOCs (1,1-DCE) and metals (arsenic).

##### **Verification and Validation of Results**

Verification ensures that data produced and used by the project are documented and traceable per quality requirements. Validation consists of a technical review of analytical results such that any limitations relative to project decisions are stated. V&V criteria include:

- Chain-of-Custody;
- Preservation and hold-times;
- Precision & Accuracy
- Instrument Calibrations;
- Preparation Blanks;
- Interference Check Samples (metals);
- Matrix Spikes/Matrix Spike Duplicates (MS/MSD);
- Lab Control Samples (LCS);
- Field Duplicate measurements;
- Chemical yield (radiochemistry);
- Required Detection Limits/Minimum Detectable Activities (sensitivity of chemical and radiochemical measurements, respectively); and,
- Sample Analysis and Preparation methods.

Evaluation of V&V criteria ensures that PARCCS (precision, accuracy, representativeness, completeness, comparability, and sensitivity) parameters are satisfactory, i.e., within tolerances acceptable to the project. Satisfactory V&V of laboratory quality controls are captured through application of validation "flags", or qualifiers, to individual records. Validation results are summarized in the "Completeness" subsection.

Field sampling was conducted according to the approved IASAP, including related SOPs and addenda. Raw hardcopy data, e.g., individual (analytical) data packages, are currently filed by RIN and are maintained by KH ASD; older hardcopies representing "legacy" data may reside in the Federal Center (Lakewood, Colorado). Digital data are stored on the RADMS server (RFETS intranet, MS ACCESS-based) and the RFETS Soil and Water Database (SWD, Oracle-based).

### **Precision and Accuracy**

Precision and accuracy of laboratory results are adequate based on validation frequencies and results, which are tabulated in the "Completeness" section.

Precision is a measure of the reproducibility of results. Precision was evaluated by comparing the QA field duplicate (duplicate) sample results to their corresponding "real" sample results. One set of field duplicate samples were collected in support of the 700-3 characterization investigation. These samples were analyzed for metals, radionuclides and VOCs. Evaluation of the QA sample results for analytes found greater than their respective detection limits revealed only one analyte, 4-Isopropyltoluene, above the QA plan's 35% relative percent difference (RPD) threshold. The RPD for 4-Isopropyltoluene sample results was at 36%. The variability seen between the duplicate/real results (1.65/2.37 ug/g) are not significant because both results are estimated ("J" qualified) and significantly below the reporting limit (RL) of 6.1. Therefore, these results do not impact project decisions.

Frequency of duplicate collection was >5%, consistent with DQOs of the project.

Field, trip and rinse blanks collected during the project indicate no false positives in the data set due to cross-contamination.

### **Representativeness**

Bias samples acquired for the project are representative of the specific areas investigated within Buildings 776 and 777. Other criteria that corroborate representativeness include:

1. Implementation of industry-standard Chain-of-Custody protocols;
2. Compliance with sample preservation and hold times; and,
3. Compliance with documented and Site-approved sampling plans and procedures, including SW-846 analytical methods.

Maps and tables of sample locations are displayed in previous sections of this report.

### **Completeness**

Sampling completeness was evaluated through an inventory of the number and types of samples acquired for the IA Group 700-3 area of interest. Specifically, were enough samples collected, and valid results produced, to make project decisions?

The following number of surface soil samples and analytical methods collected at 5 unique locations were evaluated:

Metals: 5	XRF
Radionuclides: 5	Gamma Spectroscopy
VOCs: 4	Method 6260B

The following number of borehole (subsurface soil) samples and analytical methods collected at 5 unique locations were evaluated:

Metals: 5	XRF
Radionuclides: 5	Gamma Spectroscopy

VOCs: 4

Method 6260

Beryllium and lithium are not included in the metals suite in subsurface soils (XRF). Radionuclides were determined through gamma spectroscopy, where  $^{239/240}\text{Pu}$  and  $^{233/234}\text{U}$  are inferred from  $^{241}\text{Am}$  and  $^{238}\text{U}$ , respectively.

Satisfactory V&V are indicated by a 10% (or greater) validation frequency of all results by method, and <10% rejection of those records validated. At this time sample results have not been validated.

### **Comparability**

All results presented are comparable with nation-wide Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) data and DOE complex-wide environmental data. This comparability is based on:

1. Use of standardized engineering units in the reporting of measurement results;
2. Consistent sensitivities of measurements (generally  $\leq \frac{1}{2}$  corresponding action levels); and,
3. Use of site-approved procedures, work plans, and quality controls (e.g., Contractual Statements of Work for lab analyses; DOE/KH, 2002).

### **Sensitivity**

Reporting limits, in units of ug/kg (parts per billion or ppb) for organics, mg/kg (parts per million or ppm) for metals, and picocuries (pCi/g) for radionuclides, were compared with RFCA Tier I and Tier II ALs on a record-by-record basis. Adequate sensitivities of analytical methods were attained for all results with the exception of arsenic. Analytical results reported for arsenic ranged for 0 –13.3 mg/kg, with only one surface soil sample exceeding the background level of 10.09 mg/kg. The RL for arsenic by XRF is 45 ug. "Adequate" sensitivity is defined as an RL less than the analyte's associated action level, ideally <1/2 the action level.

### **SUMMARY**

Data quality is acceptable for project decisions based on the qualifications provided above. Analytical results shall be evaluated further following the submission of validation qualifiers to determine impacts to decisions.

## 5.0 REFERENCES

DOE, 1992-2001, Historical Release Reports for the Rocky Flats Plant, Rocky Flats Plant, Golden, Colorado.

DOE, 1999, Order 414.1A, Quality Assurance.

DOE, 2000, Rocky Flats Cleanup Agreement (RFCA), Attachment 5, March.

DOE, 2001, Industrial Area Sampling and Analysis Plan, Rocky Flats Environmental Technology Site, Golden, Colorado, June.

DOE, 2002, Industrial Area Sampling and Analysis Plan Addendum #IA-02-08, Rocky Flats Environmental Technology Site, Golden, Colorado, August.

EPA QA/G-4, 1994a, Guidance for the Data Quality Objective Process.

EPA 540/R-94/012, 1994b, USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review.

EPA 540/R-94/013, 1994c, USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.

EPA QA/G-9, 1998, Guidance for the Data Quality Assessment Process; Practical Methods for Data Analysis.

Kaiser-Hill (K-H), 1997a, General Guidelines for Data Verification and Validation, DA-GR01-v1, December.

K-H, 1997b, V&V Guidelines for Volatile Organics, DA-SS01-v1, December.

K-H, 1997c, V&V Guidelines for Semivolatile Organics, DA-SS02-v1, December.

K-H, 1997d, V&V Guidelines for Metals, DA-SS05-v1, December.

K-H, 1998, V&V Guidelines for Isotopic Determinations by Alpha Spectrometry, DA-RC01-v1, February.

Lockheed-Martin, 1997, Evaluation of Radiochemical Data Usability, ES/ER/MS-5.

**ENCLOSURE**

**IHSS GROUP 700-3 RAW DATA**

Figure 1  
IA Groups Location Map

EXPLANATION

IHSS Groupings



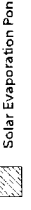
700-3

Standard Map Features

Buildings and other structures



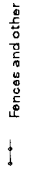
Demolished buildings



Solar Evaporation Ponds (SEPs)



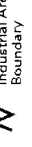
Lakes and ponds



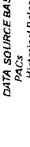
Streams, ditches, or other drainage features



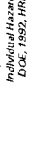
Fences and other barriers



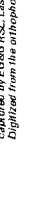
Paved roads



Dirt roads



Industrial Area Operable Unit Boundary



DATA SOURCE BASE FEATURES:

PA/Cs  
2000 Historical Release Report (HRR)  
2000 Historical Release Report (HRR)  
Sept. 30, 1997  
Industrial Hazardous Substances Site (IHSS)  
Data: 1992, HRR Report and Subsequent Updates  
The map shows the location of the IHSS site and the structures from 1992 and 1997 data.  
Captured by ECR/RSZ, Las Vegas.  
Digitized from the aerial photography, 1995

Scale = 1 : 6330  
1 inch represents approximately 528 feet



State Plane Coordinate Projection  
Colorado Central Zone  
Datum: NAD27

U.S. Department of Energy  
Rocky Flats Environmental Technology Site

GIS Dept 303-966-7707

Prepared for:

**DynCorp**  
THE ART OF TECHNOLOGY



August 09, 2002

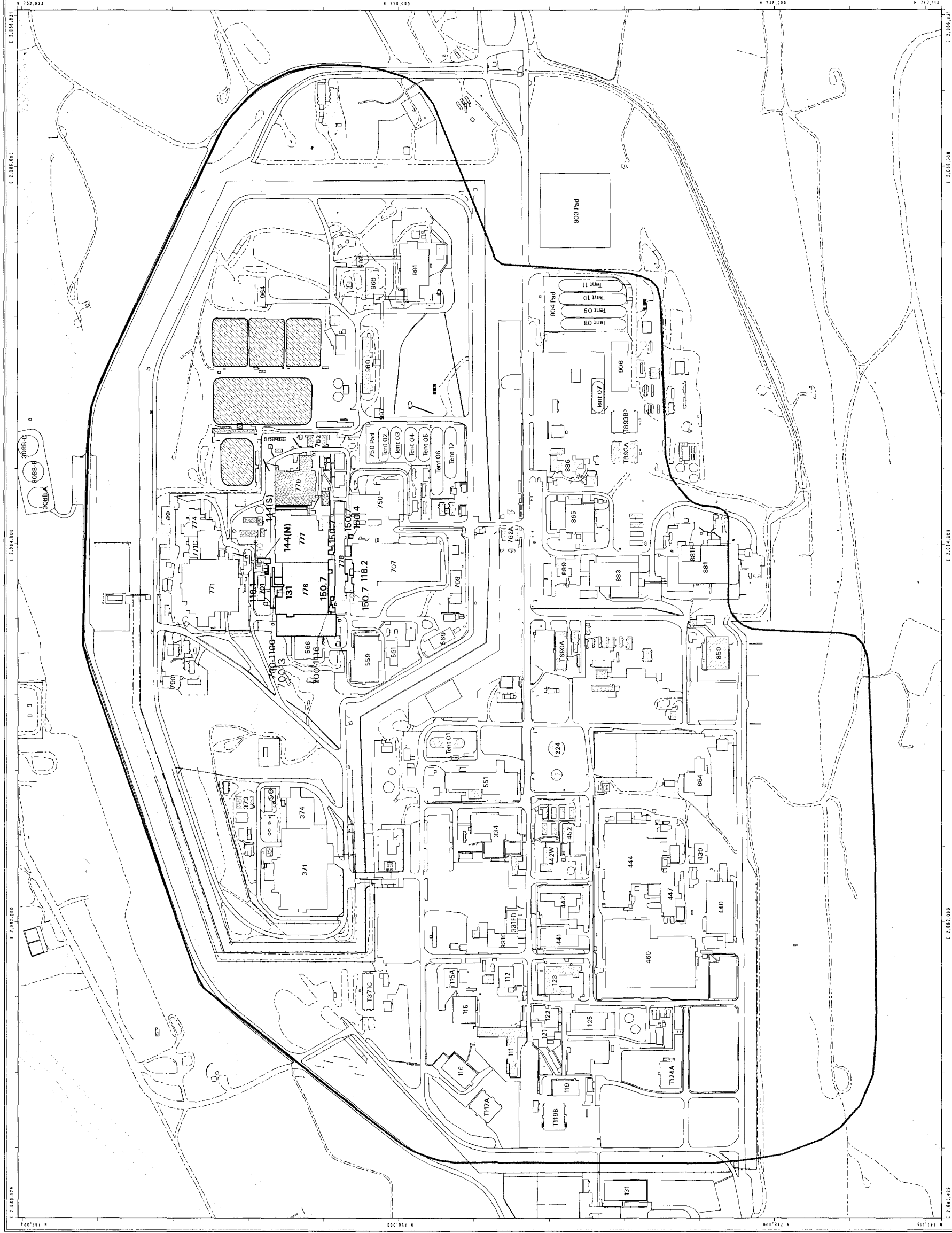


Figure 2  
Group 700-3  
Buildings 776 and 777 Soil Results Greater  
Than Background Mean Plus Two Standard  
Deviations or Reporting Limits

Key

- Results greater than  
Tier II Action Levels
- Results less than  
Tier II Action Levels

Building

Streams

Paved Road

Sbd = Sample Begin Depth

Sed = Sample End Depth

RI = Reporting Limit



Scale = 1:1000

State Plane Coordinate Projection  
Colorado Central Zone  
Datum: NAD 27

U.S. Department of Energy  
Rocky Flats Environmental Technology Site

Prepared by:



Prepared for:



KAISER HILL  
Environmental Monitoring Technology  
File: W:\Project\F2003700-3\Data Summary Date: 2/9/03

Analyte	Result	Unit	RI	Sbd	ft	Sed	ft	Mean	2sd	Tier I	Tier II
1,1-Dichloroethene	24.11	ug/kg	6.1	0.5	2.50	NA	NA	NA	NA	2190.00	21.90

Analyte	Result	Unit	RI	Sbd	ft	Sed	ft	Mean	2sd	Tier I	Tier II
Barium	242.00	mg/kg	150	0.0	0.50	0.00	0.00	141.26	0.00	133000.00	7470.00
Cobalt	45.70	mg/kg	300	0.0	0.50	0.00	0.00	18.06	0.00	115000.00	11500.00
U-235	0.15	pCi/g	8	0.0	0.50	0.00	0.00	0.09	0.00	133000.00	1000.00
U-238/234	2.00	pCi/g	8	0.0	0.50	0.00	0.00	2.00	0.00	133000.00	1000.00
Vanadium	156.00	mg/kg	100	0.0	0.50	0.00	0.00	45.59	0.00	133000.00	103.00
Barium	424.00	mg/kg	150	0.0	0.50	0.00	0.00	289.38	0.00	133000.00	133000.00
Copper	51.50	mg/kg	300	0.0	0.50	0.00	0.00	38.21	0.00	115000.00	11500.00
U-235	0.35	pCi/g	1	0.0	0.50	0.00	0.00	0.12	0.00	133000.00	24.00
U-238/234	2.70	pCi/g	8	0.0	0.50	0.00	0.00	1.49	0.00	133000.00	103.00
Vanadium	147.00	mg/kg	100	0.0	0.50	0.00	0.00	88.49	0.00	133000.00	13400.00

CG45-000

CE46-000

CF45-002

CF45-003

777

776

Analyte	Result	Unit	RI	Sbd	ft	Sed	ft	Mean	2sd	Tier I	Tier II
Barium	889.00	mg/kg	150	0.0	0.50	0.00	0.00	141.26	0.00	133000.00	133000.00
Cobalt	249.00	mg/kg	300	0.0	0.50	0.00	0.00	18.06	0.00	115000.00	115000.00
U-235	45.40	mg/kg	300	0.0	0.50	0.00	0.00	18.06	0.00	115000.00	115000.00
U-238/234	915.00	mg/kg	150	0.0	0.50	0.00	0.00	289.38	0.00	133000.00	133000.00
Vanadium	116.00	mg/kg	90	0.0	0.50	0.00	0.00	29.04	0.00	115000.00	115000.00
Copper	52.90	mg/kg	300	0.0	0.50	0.00	0.00	38.21	0.00	115000.00	115000.00
U-235	0.20	pCi/g	1	0.0	0.50	0.00	0.00	0.12	0.00	133000.00	24.00
U-238/234	4.60	pCi/g	8	0.0	0.50	0.00	0.00	1.49	0.00	133000.00	103.00

Analyte	Result	Unit	RI	Sbd	ft	Sed	ft	Mean	2sd	Tier I	Tier II
Arsenic	13.30	mg/kg	25.0	0.0	0.50	0.00	0.00	10.1	0.00	296.00	2.96

Analyte	Result	Unit	RI	Sbd	ft	Sed	ft	Mean	2sd	Tier I	Tier II
1,1-Dichloroethene	69.94	ug/kg	6	0.0	0.50	0.00	0.00	0.00	0.00	747000.00	7470.00
Barium	557.00	mg/kg	150	0.0	0.50	0.00	0.00	141.26	0.00	133000.00	133000.00
Cobalt	28.70	mg/kg	20	0.0	0.50	0.00	0.00	54.62	0.00	1000.00	1000.00
U-235	4.10	pCi/g	8	0.0	0.50	0.00	0.00	2.00	0.00	133000.00	103.00
U-238/234	503.00	mg/kg	150	0.0	0.50	0.00	0.00	289.38	0.00	133000.00	133000.00
Vanadium	0.17	pCi/g	1	0.0	0.50	0.00	0.00	0.12	0.00	133000.00	24.00
U-235	4.20	pCi/g	8	0.0	0.50	0.00	0.00	1.49	0.00	133000.00	103.00
U-238/234	92.30	mg/kg	100	0.0	0.50	0.00	0.00	88.49	0.00	133000.00	13400.00

Analyte	Result	Unit	RI	Sbd	ft	Sed	ft	Mean	2sd	Tier I	Tier II
Barium	825.00	mg/kg	150	0.0	0.50	0.00	0.00	141.26	0.00	133000.00	133000.00
Cobalt	29.00	mg/kg	300	0.0	0.50	0.00	0.00	18.06	0.00	115000.00	115000.00
U-235	27.90	mg/kg	20	0.0	0.50	0.00	0.00	54.62	0.00	1000.00	1000.00
U-238/234	0.17	pCi/g	1	0.0	0.50	0.00	0.00	0.09	0.00	133000.00	24.00
Vanadium	98.70	mg/kg	100	0.0	0.50	0.00	0.00	45.59	0.00	133000.00	13400.00
Barium	804.00	mg/kg	150	0.0	0.50	0.00	0.00	289.38	0.00	133000.00	133000.00
Cobalt	122.00	mg/kg	90	0.0	0.50	0.00	0.00	29.04	0.00	115000.00	115000.00
Copper	50.10	mg/kg	300	0.0	0.50	0.00	0.00	38.21	0.00	115000.00	115000.00
U-235	1.71	pCi/g	8	0.0	0.50	0.00	0.00	0.12	0.00	133000.00	24.00
U-238/234	2.10	pCi/g	8	0.0	0.50	0.00	0.00	1.49	0.00	133000.00	103.00